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RESEARCH UPDATE U96-6

FAILURE OF BREAKAWAY COUPLING UNITS

BACKGROUND:

The Vermont Agency of Transportation first became aware of a significant problem with TRANSPO Model 101 breakaway coupling units on 30 Nov 95 when a street lamp pole on the eastbound entrance ramp from US Rte.7 to Interstate I-189 in South Burlington failed. The failure might easily have caused a serious accident; however, in this case the pole fell in a direction away from the traveled way and there were no injuries involved. Since the shop drawings for the couplings in question were approved in September of 1987, the units were probably installed in 1988, making them approximately seven years old. Another similar incident occurred a short time later, when a light pole failed near the US Rte 2 - Prospect St. intersection in Burlington. On that occasion the pole damaged a vehicle.

Recognizing the need for immediate action, the Agency initiated an investigation to determine the nature of the problem. It was already known that similar problems had been experienced in other states and that the breakaway couplings most commonly failed because they are prone to corrosion.

Inspection at the accident site and of several other units within the vicinity confirmed suspicions that the failure was related to the corrosion of the aluminum breakaway coupling units. The fallen luminaire had been secured to its anchor with four TRANSPO model 101 breakaway coupling units. All four units were severely corroded on the exterior and also on the interior threaded portions of the couplings. This susceptibility has been most commonly found in the TRANSPO model 101 and is due to the aluminum alloy used in the manufacture of these units. TRANSPO has since introduced models 201 and 301 which are made with aluminum alloys which are reported to be less sensitive to corrosion.

PROBLEM ANALYSIS:

Several causes of the corrosion problem (in other states) had been identified by the FHWA in an earlier study, and all of these probably contributed to the deterioration of the units on I-189. Further inspections were undertaken and three other factors, not

mentioned in the FHWA memorandum seemed common to all of the corroded units:

1. Proximity to the traveled surface, and therefore frequent exposure to chloride saturated roadway run-off.

2. A buildup of organic debris, partially or entirely burying the luminaire anchors always accompanied the most severely corroded units. The debris, most probably washed in during rain storms, apparently maintains a humid atmosphere within the anchor unit enclosure, catalyzing the corrosion process.

3. Ponding and retention of moisture in the area surrounding the luminaire anchors. The Vermont standard for the breakaway coupling unit specifies a maximum protrusion of 102 mm of the anchor bolts above the existing ground level. This has been an inducement to install the anchors in a depression, which leads to ponding and moisture retention.

INTERIM PROBLEM RESOLUTION:

After completing an initial study of the problem, the Agency formulated a policy to replace all breakaway coupling units, with transformer bases which are not susceptible to corrosion. This decision was further motivated by the fact that collisions with luminaires supported by transformer bases do not usually damage the lamp pole since the transformer base bears the impact, while a collision with a luminaire supported by a breakaway coupling unit usually requires replacement of the pole. This policy has not been implemented, however, due to financial constraints.

Since it is not feasible to replace all of the breakaway coupling units at present, it is clear that some sort of interim maintenance procedure needs to be established that will extend the service lives of the existing breakaway coupling units, and insure the public safety. The following course of action is suggested:

- Conduct an initial inspection of all breakaway coupling units, especially if they are of model 101 design.

- Establish a schedule of yearly inspection and a routine maintenance procedure. The procedure should include cleaning of the base and breakaway coupling units to remove soluble chloride residues. Debris should be removed from around the base and from the immediate vicinity.

- Replace all seriously damaged model 101 units with the more recent model 201 or 301 units.

It is hoped that this report may serve as an advisory to other states, particularly those that have the TRANSPO breakaway coupling units in their roadway inventory. Vermont Agency of Transportation policy may be inappropriate in other locations. However, it would appear there is at least a clear need for periodic inspection and a routine maintenance schedule wherever these units are in use.